## REMARKS

Claims 1-4, 7, 21-23 and 28-30 currently appear in this application. The Office Action of June 28, 2004, has been carefully studied. These claims define novel and unobvious subject matter under Sections 102 and 103 of 35 U.S.C., and therefore should be allowed. Applicants respectfully request favorable reconsideration, entry of the present amendment, and formal allowance of the claims.

**Rejections under 35 U.S.C. 112**

Claims 1-4, 7, 21-23 and 28-30 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The Examiner states that the specification does not disclose how the matrix resin is used to control the coefficient of linear expansion of the composite material. Claims 1-4, 7, 21-23 and 28-30 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claims are said to contain subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains to make and/or use the invention. The Examiner alleges that there is no teaching in the specification of the amount of resin required to control the coefficient of linear expansion.

These rejections are respectfully traversed. The abstract submitted with the application as filed states, "A fiber-reinforced resin composite material which comprises an in-plane pseudoisotropic plate formed by providing two or more types of reinforcing fibers, at least one of which has a negative coefficient of linear expansion, preparing a prepreg sheet comprising a combination of such fibers and laminating such sheets, and is adjusted to have a reduced coefficient of linear expansion, in particular, to have the coefficient [of linear expansion] of zero. **The coefficient of linear expansion of the composite material is adjusted to be as small as possible in the course of manufacture of the material using various means, that is, by yarn doubling or commingling of a combination of two or more types of reinforcing fibers, by combining various prepreg sheets formed form the resultant fiber bundles by preparing a fiber bundle having a predetermined coefficient by yarn doubling or the like, by changing the three-dimensional structure of doubled fibers, woven fabric or the like, or by a combination of the above**."[emphasis added].

The Figures show different configurations for fibers that can be used to reduce the coefficient of linear expansion. An example on page 10 describes forming a sheet of reinforced fibers in a variety of configurations, "An in-place

quasi-isotropic material is formed by laminating these sheets and hardened [hardening] so as to form composite material. The coefficient of linear expansion of the respective fiber and sheet in the composite material can be judged in a macro view." The coefficient of linear expansion of a blend of fibers can be determined by the equation shown on page 11, line 7.

The coefficient of thermal expansion of an epoxy resin is positive. There is no formula for combining an epoxy resin with the reinforcing fibers which have a negative coefficient of linear expansion, as this can only be confirmed empirically or experimentally as shown in the present application. However, the test is not whether experimentation is required, but whether **undue** experimentation is required. One skilled in the art of composite materials can readily prepare varying combinations of fibers and resin by conventional methods of forming composite resin-fiber materials to obtain a material having a desired coefficient of linear expansion.

**Art Rejections**

Claims 1-3 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyadera et al. in view of Nelson.

This rejection is respectfully traversed. Claims 1 and 4 have been amended to recite that the reinforcing fibers

can all have a negative coefficient of linear expansion. Support for this limitation can be found in the specification as filed at page 9 in the description of Figure 4(a), wherein it is stated, "In these examples, the fiber bundles have the same coefficient of linear expansion…" Neither Miyadera et al. or Nelson discloses or suggests that the fibers all have the same coefficient of linear expansion which, for purposes of the present invention, must be negative so that they can lower the coefficient of linear expansion of the resin with which they are combined.

Miyadera et al. disclose prepregs formed from resins and composite fabrics. However, there is no disclosure that the coefficient of linear expansion approaches zero, only that the laminate has a low expansion coefficient. Nelson merely discloses that a zero coefficient of linear expansion can be reached by balancing negative coefficient fibers with a relative amount of epoxy resin. However, Nelson only discloses using one type of fiber, not two or more kinds of reinforcing fibers.

Claims 1, 2, 4, 21 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kashima et al. in view of Nelson.

This rejection is respectfully traversed. The present invention is directed to a composite material in which

the reinforcing fibers are present in the matrix in quantity sufficient to produce a composite having a coefficient of expansion approaching zero. Kashima et al., on the other hand, specifically disclose that thermal contraction of fiber-reinforced plastic can be controlled using reinforcing fiber materials having reciprocal thermal expansion properties. Nelson's disclosure of obtaining a zero coefficient of linear expansion adds nothing to Kashima et al., as one using fibers having reciprocal thermal expansion properties would not be motivated to substitute therefore one type of fiber having negative thermal expansion properties.

Claims 1, 2, 4, 21, 23, 28 and 30 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Leibowitz in view of Nelson.

This rejection is respectfully traversed. The Examiner concedes that Leibowitz does not specifically state that the epoxy resin is used to control the coefficient of linear expansion of the laminate to substantially zero. However, there is nothing in Nelson that would lead one skilled in the art to factor in the epoxy resin in obtaining a composite with a coefficient of linear expansion approaching zero, as there is nothing in Nelson that suggests producing a composite having a coefficient of thermal expansion nearing zero using a plurality of types of fibers. Thus, there is no

motivation to substitute the epoxy of Nelson for the resin used in Leibowitz.

Claims 3, 7, 22 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leibowitz in view of Nelson and further in view of Yuan.

As noted above, Leibowitz does not control the coefficient of thermal expansion by use of the resin. Nelson has no interest in obtaining a coefficient of thermal expansion approaching zero using a plurality of types of fibers. Yuan adds nothing to the disclosures of Leibowitz and Nelson, because "Yuan merely teaches that triaxial fabric can be used to create a range of designs and parameters of strength, density, weight and porosity. Yuan is completely silent with respect to coefficient of thermal expansion, so there would be no reason to substitute a configuration as shown in Yuan in either Nelson or Leibowitz, or the combination of Nelson and Leibowitz.

Clams 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyadera et al. in view of Nelson and further in view of Leibowitz.

This rejection is respectfully traversed. Miyadera et al. neither disclose nor suggest a coefficient of linear expansion approaching zero. Nelson only uses one kind of fiber to produce a composite having a coefficient of thermal

expansion approaching zero. Leibowitz uses the fibers in the composite to control the coefficient of thermal expansion, not a combination of the resin and the reinforcing fibers. There is nothing in Leibowitz that would lead one to use the Miyadera et al. fabric comprising 30-95% by weight aromatic polyamide fiber and 5-70% of glass fiber, as there is no suggestion that the Miyadera et al. composite has a coefficient of linear expansion approaching zero.

In response to the Examiner's responses to argument, it is respectfully submitted that, in order to produce a composite having a coefficient of linear expansion approaching zero, one must combine fibers and resins having differing coefficients of linear expansion that would approach zero. A linear expansion coefficient of zero is obtained when one combines materials having a negative expansion coefficient and a positive coefficient. It is assumed that one skilled in the art recognizes that zero can only be obtained by combining a negative number with the corresponding positive number. Table 3 on page 13 discloses a composite in which the coefficient of thermal expansion is zero. Page 15 specifically states, "In the above embodiments, epoxy resin is used as a matrix. ...Characteristics of resin such as coefficient of thermal expansion may be controlled by blending various fillers in the resin."

In view of the above, it is respectfully submitted that the claims are now in condition for allowance, and favorable action thereon is earnestly solicited.

Respectfully submitted,

BROWDY AND NEIMARK, P.L.L.C.
Attorneys for Applicant

By: ______________________
Anne M. Kornbau
Registration No. 25,884

AMK:srd
Telephone No.: (202) 628-5197
Facsimile No.: (202) 737-3528
G:\BN\O\Ohta\Kubomura 1\PTO\AMD 24 SEP 04.doc